NASA Advisory Council (NAC)
Aeronautics Committee

July 30, 2010
Glenn Research Center, Cleveland, Ohio
Building 15, Small Conference Room

Meeting Minutes

Participants:

First	Last	Organization	Role
Marion	Blakey	AIA	Chair
Ilan	Kroo	Stanford U.	Member
Harry	McDonald	U. of Tenn.	Member
Mark	Lewis	U. of MD	Member
John	Hansman	MIT	Member
Susan	Minor	NASA	Executive Sec.
John	Cavolowsky	NASA	Presenter
Douglas A.	Rohn	NASA	Presenter
Bill	Wessel	NASA	Presenter
Jay	Dryer	NASA	Presenter
Jean	Wolfe	NASA	Observer
Jih-Fen	Lei	NASA	Observer
Jean	Wolfe	NASA	Observer

July 30th:

The meeting was called to order at 8:00 a.m.

Welcome, Introductions and Opening Remarks (*Marion Blakey, Susan Minor)*

After introductory meeting logistics from Susan Minor, Marion Blakey welcomed the members and went over the agenda for the meeting. The Committee was informed that Dr. Shin was unable to attend the meeting due to last minute flight delays.

Glenn Research Center Overview Briefing *(Mr. Bill Wessel)*

Mr. Bill Wessel, Associate Director, gave an overview of Glenn Research Center (GRC) focusing on the extensive work that GRC does for the Aeronautics Directorate. Dr. MacDonald inquired about the status of the Plumbrook facility. Mr. Wessel stated that it is in the final stages of decommissioning and that there was a little more work to be done. He felt that one of the greatest lessons learned from the decommissioning was in the area of risk management. There was a lot of underground pipes associated with the clean up and rather than dig up the pipes, workers at GRC were able to cost effectively clean out the pipes and fill them with grout. Dr. Lewis asked about the future of the facility. Mr. Wessel indicated that had not yet been decided. He felt there was a business case for commercial use of the campus, and that ultimately it would be utilized in some fashion. He did confirm that the Agency had no plans to build an air strip there, but the local community was investigating putting one there. Ms. Blakey asked why the Agency wouldn't build an air strip there, and Mr. Wessel indicated that it was not within the current cost and priorities of the Agency. However, NASA is doing the environmental studies to enable an air strip and is in the center master plan since it would be located on NASA property.

Dr. Lewis asked how the center tracked technical publications. Mr. Wessel said they use bibliometry to keep track of them and Dr. Lei said they track the number of citations as well as other metrics.

Dr. Wessel then addressed some of the work that GRC was doing in the area of green aviation including noise and emissions reduction and alternative fuels research. Dr. MacDonald asked if they had a program on fuel cells. Dr. Lei indicated that they were working on fuel efficient fuel cells and integration of the technology. In response to a query from Dr. Kroo, she indicated that they were also working on advanced battery technology.

Mobility Challenges in NextGen*(Dr. John Cavolowsky)*

Dr. Cavolowsky, program director of the Airspace Systems Program (ASP), introduced the topic of Next Generation Air Transportation System (NextGen) mobility research and the use of Research Transition Teams (RTTs). He briefly covered the overall structure of the projects within ASP and how each project has specific responsibilities in

advancing the technology readiness level (TRL) in different area and how the research connects to the National Aeronautics Research and Development Plan (Plan) and the Joint Program Development Office (JPDO) Integrated Work Plan (IWP). He also said that ASP does try and address all the mobility challenges reflected in the Plan but it was not his intent to address a mapping from the JPDO IWP to the mobility goals. Dr. Hansman asked what specific technology pieces has the ASP Systems Analysis, Integration, Evaluation (SAIE) Project decided to mature and the process for doing so. Dr. Cavolowsky stated that as of yet, no products coming out of that project have been matured and transitioned to the user. However, ASP is conducting an overall portfolio analysis to make sure that both projects address the technology items that will have the biggest impacts once transitioned.

Dr. Cavolowsky stated that ASP currently manages technology transition through the mechanism of the Research Transition Teams (RTTs). In response to a question from Dr. Hansman, Dr. Cavolowsky said that the intended outcome of projects in his purview would be successful transition to the stakeholder (e.g., the Federal Aviation Administration). Dr. Hansman questioned the strategy rather than the mechanism of technology transition being used. Ms. Blakey questioned the ability of technologies to achieve TRL 8 and 9 if there is no project responsibility in those areas. She questioned if the plan was for industry (or some other stakeholder) to mature beyond TRL 7. She would like to hear how the RTTs work within the working groups at the JPDO. Dr. Cavolowsky believes that Dr, Karlin Toner, Director of the JPDO, is currently reevaluating the structure of the working groups and how they interact. To date, there hasn't been a strong linkage between the JPDO and the NextGen Institute. The impetus currently has been coming from OMB to integrate NASA's work into those working groups that are focused on transition. He believes that Dr. Tone is looking to arrange her working groups similarly. Ms. Blakey asked if any technology "orphans" existed as result of the mapping exercises. Dr. Cavolowsky said that all of NASA's research is 100% mapped to research needs (as identified by JPDO and/or the National Plan). However, he did say that there are needs which are orphans but they weren't viewed as high value needs. In addition, he indicated that there is some research that they (ASP) are doing, such as wake vortices studies, which are only being done at an acceptable level. ASP is limited in depth of research by resource limitations. Ms. Blakey would like to see a chart on what the various groups are contributing between the various centers (NASA, the FAA Tech Center, Mitre, etc…). Dr. Cavolowsky didn't think such a representation exited, but he would talk to Mr. Barry Scott of the FAA about a comprehensive map. He did feel that it would be a JPDO responsibility to track at that level. Dr. McDonald addressed the area of human factors research and if that research extended to operations as well as air crew. Dr. Cavolowsky said that to date the majority of the work has been focused on flight deck. Any study of operations tended to be embedded in the flight deck research.

Dr. Cavolowsky addressed the progress the RTTs were making. Ms. Blakey asked how the RTTs were demonstrating return on investment (ROI). She asked if they were working more from the standpoint of demonstrating performance, or were addressing

economics. Dr, Cavolowsky replied that they were still focusing on technology performance but they were helping their industry partners in understanding the ROI. In response to Dr. Hansman, Dr. Cavolowsky said that one example would be looking at the ROI to the operator of a system such as Automatic Dependent Surveillance-Broadcast (ADS-B). In this effort they were coordinating with the ADS-B Program Office as well.

Dr. Cavolowsky concluded his presentation by saying that the ASP is actively engaged with industry, academia, and government partners through various forums. Ms. Blakey asked if those users forums included manufactures. Dr. Cavolowsky said they were looking at both sides of the question – first the users and then the manufacturers. For example, a pre-solicitation conference would build off items addressed in a user's forum to understand where the key technology drivers are. Dr. Hansman stated that the utility of ADS-B was more in the application rather than the technology itself. He felt that ASP needed to have a better linkage into ongoing efforts in this regard. I.e., ASP should address applications that need to be developed. Dr. Cavolowsky affirmed that that is exactly what ASP is targeting. They are focusing on how users engage with the box, as well as the technology in the box.

Dr. Mark Lewis asked how ASP was addressing the issue of unmanned aircraft in the national airspace. Dr. Cavolowsky said that ASP was working with the ISRP in developing a new five year project to address unmanned aircraft. There are clearly some capabilities that reside in ASP, and the two programs are working together to develop milestone within that new project.

Energy/Environment Challenges in NextGen (*Mr. Jay Dryer)*

Mr. Jay Dryer, program director of the Fundamental Aeronautics Program (FAP) briefed the committee members on the NextGen technical challenges within the energy and environment arena. He informed the committee that he has seen greater synergy between national challenges and the technology that NASA is working on.

He covered the current metrics and challenges in noise, emissions, and performance for subsonic, supersonic, hypersonic, and rotorcraft vehicles. Mr. Dyer also explained the synergy between FAP and the other programs within ARMD. For example, AvSP is enabling some of the concepts within the icing challenge area. Dr. Hansman inquired how the program addressed innovative operating concepts. Mr. Dryer said they were looking at some cases such as technologies that enabled the use of reduced field lengths. Dr. Hansman asked who had the overall responsibility for looking at new operating concepts. Mr. Dryer said they worked with ASP, but overall implementation lied within ASP. Dr. Kroo asked how practical aspects, such as feasibility and cost risk, affected technical challenges. His example was Mach 3 flight , which is not currently cost effective. Mr. Dryer said FAP looked at things from a systems analysis perspective, so they look at the entire trade space. For example, they have a greater awareness of how technology issues on the vehicle side affect the airspace. Dr. Lewis

said that NASA continued to look at an informed trade space, such as how a benefit in noise will degrade the emissions environment. Mr. Dryer said FAP is also looking at developing tools that will allow someone else to make that trade. He feels the commercial sector is ultimately going to make the decision and we (NASA) want to give them the tools to make the best decision possible.

Dr. Kroo said that the N+2 goals for subsonic/supersonic vehicles were rationale but seemed a little unrealistic. Mr. Dryer replied that the Environmentally Responsible Aviation (ERA) Project within the Integrated Systems Research Program (ISRP) is looking at refining the scope of the goals and adding a more practical side to the research. Ms. Blakey asked about how NASA was addressing green operations. Dr. Cavolowsky said NASA had originally looked at having a project within ISRP that would address green operations but that if fit more neatly within the restructured ASP. Ms. Blakey asked how much money NASA was investing in ISRP. Ms. Wolfe replied that the current budge for ISRP is $XX in 2010. Ms. Blakey felt that there still seems to be a huge focus on the vehicle side. Dr. Cavolowsky replied they are investing about $85 million in operations. Dr. Hansman asked how much of that portfolio was addressing green operations. Dr. Cavolowsky replied that a huge part of what ASP is doing will have "green" benefits. NextGen is targeted on capacity and efficiency, which have tangential environmental benefits. Dr. Hansman agreed, but wanted to know if anybody was specifically looking at green operations and what the new concepts were. Ms. Blakey felt this area had a good deal of urgency and could enable NASA to be in the forefront of decisions being made on environmental operations. She cited a lawsuit that is in the works that would force the Environmental Protection Agency to regulate CO2 emissions.

Mr. Dryer covered an example of work that related to , in particular, the green aspects of aviation. The Aviation Alternative Fuel EXperiment (AAFEX) evaluated the effects of synthetic fuels on aircraft engine emissions. Dr. Lewis wondered if there were lessons being learned in the development of these fuels that could be applied to the certification process. Mr. Dryer said that they have not completely closed the loop on the process, but FAP is aware of some of the issues surrounding certification.

Safety Challenges in NextGen *(Mr. Doug Rohn)*

Mr. Doug Rohn addressed the challenges related to aviation safety as defined in the Plan. He first outlined the current program and project replanning efforts being undertaken by the Aviation Safety Program (AvSP). Mr. Rohn said that the replanning would address issues outline in the Plan as well as items outlined in the National Aviation Safety Strategic Plan, which is a JPDO document. Dr. Hansman questioned the utility of reorganizing the current program, but Mr. Rohn stated that the current program was focused in too many areas, and not enough could get accomplished with the limited resources available. In addition, Validation and Verification of Flight Critical Systems is being added to the portfolio. Dr. Hansman expressed concern that frequent reorganizing can create a demoralizing effect on the workforce. Mr. Rohn agreed , but

felt that the reorganization was helping by addressing the issues of people being spread too thin over too many projects.

Mr. Rohn stepped through the different projects within AvSP and outlined how each one was addressing technical challenges in NextGen. Vehicle Systems Safety Technologies (VSST) deals with loss of control, health management, and situational awareness. When questioned about materials science research, Mr. Rohn said current research was being done more at a molecular level and would have an effect in more of the N+2 or N+3 timeframe. From a research perspective, he was looking at having this work done within the Subsonic Project of FAP rather than in AvSP. For example, within the loss of control area of research they were definitely looking at that from a future vehicle perspective. Dr. Kroo asked if there was coordinating with researchers in FAP in these areas to delve into the more future vehicle aspects, or if VSST research was still proceeding in the usual vein. Mr Rohn replied that he is stressing the former although the latter mode of research still seems to be prevalent. He is seeking ways to encourage the collaboration and plug that back into the program planning.

Dr. Lewis asked how the AvSP participates in setting standard and guidelines in aviation safety. Mr. Rohn said that if NASA has directly developed something, then we engage heavily in setting the guidelines. For more formal community-wide guidelines, NASA's involvement resides in committee participation. AvSP provides the knowledge that the committee can use in setting a particular standard. Mr. Rohn feels that NASA's job is to get technologies out there to improve safety. Dr. Hansman felt that perhaps NASA 's focus was to narrow if they focused solely on technology and "widgets" in order to make improvements. Dr. Hansman stated that advancing the state of knowledge is valuable and success can be achieved by bringing about understanding. He cited the example of human factors research.

Within the Atmospheric Environment Safety Technologies (AEST) project, Mr. Rohn indicated that current research efforts were focused on in-flight icing and other hazard sensing. One new effort that was undertaken with recovery act money was the modification of the PSL at Glenn Research Center to simulate engine icing. Dr. McDonald asked if AvSP was looking at ash as part of their hazards research and how prioritization was being done. Mr. Rohn said that they used the Plan as guidance but were also looking at doing some in-house studies. Dr. Hansman said because the Plan is so vague in certain areas, NASA might get more benefit by looking at things from the Commercial Aviation Service (CAS) perspective. Mr. Rohn said that Dr. Shin is starting a new effort within ARMD to look at things from more strategic and systems analysis perspective. Mr. Robert Pearce will be looking at doing a portfolio analysis type effort.

Verification and Validation of Flight Critical Systems *(Mr. Doug Rohn)*

Mr. Doug Rohn presented the current planning efforts for the Verification and Validation of Flight Critical Systems (VVFCS). VVFCS is a subproject within the System-Wide Safety and Assurance Technologies Project. He also gave the Committee background information on the replanning efforts for the entire Aviation Safety Program and how VVFC will be integrated into the reorganized program. Ms. Blakey questioned how the program was planning to communicate the value of VVFCS that made it accessible to the general public. Dr. McDonald stated that at one time there was a view that you could certainly never do enough V&V and one of the things involved in this was fault tolerance. Mr. Cavolowsky said that aeronautics does not have much of a community involving fault tolerance and that it is much more active on the space side of NASA. Dr. Hansman asked about a draft project plan. Mr. Rohn said that since this wasn't a formal project, but a subproject, that there wasn't a formal project plan. There is, however, a technical plan that is in draft form. The planning team hopes to have a finalized technical plan by the end of the summer. Dr. Hansman felt that the Committee needs more substantive information concerning the goals, objectives, and success criteria for this effort. Mr. Rohn felt that part of the success dealt with the development of the tools for VVFCS that would reduce the cost and lower the barriers for successful system V&V. But, he also said that success also depended on what area of safety research was being addressed. For example, argument based safety cases are more of an approach than a result. Ms. Blakey inquired about the planned work products from the team over the next year. Mr. Rohn said that the plan is initially being laid out over the timeframe of the president's budget, but ultimately will be laid out over the next 10 years.

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NRC Flight Research Study*(All)*

Ms. Minor introduced the topic indicating that the terms of reference (TOR) are for a NRC flight research study whose goal is to provide guidance to ARMD on the best way to structure a future program given the limitations of current resources. Dr. Kroo felt that the TOR did not adequately address what the purpose of a flight research program woud be. He indicated that flight research should be a means to an end and it should a focus more on an aspect of flight research that is connected to the goals of ARMD. Dr. Hansman agreed with this approach and asked what the need is going forward for flight research and in what areas it is needed. Dr. Hansman also felt that it was important to open the scope to include other facilities outside of Dryden Flight Research Center's assets. Dr. Cavolowsky said that one thing NASA was looking at was what residual need is there that wind tunnels and ground tests cannot do. In response to Dr. Hansman, Dr. Cavolowsky also stated that they would be addressing risk reduction up front in any research plan, and that they also envision partnering in flight research as a way to bridge the gaps that other forms of testing cannot accomplish. Dr. Hansman said that high ice water content research was a potential area for good international collaboration. Mr. Rohn indicated that there is a request for proposals out right now on that very subject.

Mr. Dryer also stated that the research plane methodology has been a successful way to transition technology. Dr. Hansman felt that NASA needed to stay out of the X-plane mode, especially if the determination of success was in transferring technology. Mr. Dryer said the success was not only in that area, but also in gaining knowledge and reducing the risk for other things.

Closing Remarks *(Marion Blakey)*

Ms. Blakey thanked everyone for their contributions to the meeting and thought that the discussions and presentations were very helpful to the committee.

The public meeting was adjourned July 30th, at 1 p.m.

Actions

- A copy of the current technical plan for the VVFCS will be e-mailed to the members by the executive secretary.